

# **Forbes Marshall**

Energising Businesses and Communities Worldwide

Reduce Energy & Environmental Impact by Implementing Sustainable Solutions



FORBES MARSHALL

## Reduce Energy & Environmental Impact- By Implementing Sustainable

TORBES MARSHALL



**Practices** 

- Conversion Cost Reduction (Steam)
- Optimum steam Intensity
- Pinch analysis Optimizing heating/cooling systems
- Work out Feasibility with ROI
- Steam Cost with Capex & Opex
- Reducing water waste and impact on local water resources
- Improved Condensate recovery
- Water used in production is treated and reused within the process
- Optimise Feed rate/Rejection rate

# Why Steam only



#### Energy

Parameters	FY 2019-20 Consumption in GJ	FY 2018-19 Consumption in GJ	
Diesel	29,901	51,975	
Natural Gas	117.241	277.857	
Coal	9,497,561	9,011,462	
Grid electricity	234,977	201,067	
Solar power generated	1,526	1,508	
Furnace Oil	12,381	12,696	
Waste Heat Recovery	60,821	88,558	
Purchased Steam	127,302	154,826	
Steam Recovered from Waste Heat Columns	739,467	698,770	
Total energy consumption in FY 19-20	10,821,177	10,498,719	
Specific Energy Consumption (GJ/million INR)	280	264	

## 90% Energy Generated Through COAL !!

#### Water

44% Avg water recycled only

Parameters	FY 2021-22 (Kl)	FY 2020-21 (Kl)
Water withdrawal	23,29,428	18,47,766
Water Recycled	10,29,293	8,98,773
Water discharge	1,76,140	1,13,371
Water consumed	21,53,287	17,34,395
Specific Water Consumption (KI/MT)	2.68	2.53
Percentage of Water Recycled	44%	40%

Proprietary content

# Why Steam only



Fuel	Energy-GJ	Fuel TPD	CO2 TPD	% Contribution
Coal	9497561	1442.2	2480.5	90%
Natural Gas	117241	10.2	32.3	0.6%
Furance oil	42282	5.1	16.9	0.3%
Others	1164093	140.6	250.3	8.8%
Total Energy	10821177		2780	

Fuel Type Daily Steam Generation TPD		Fuel Consumed TPD for Steam Generation	CO2 Emissions TPD	Make up water consumed TPD
Coal	4480	1092	1944	2344

CO2 emission by steam system is 70% as against the total CO2

# **Benefits Delivered @ Chemical Group - Gujrat**

Impact on Key Performance Parameters @ 5 plants



CO<sub>2</sub> reduction 291 TPD (15% Reduction)



Steam Savings 670TPD (9-10% of Total steam)



Fuel savings 164TPD





Water Savings 800-900 KLD ( Recycle content-56%)



Savings on fuel bill 40 Cr



Enhanced safety Zero leak – Zero drain





Savings (water cost) 9-9.5 Cr /year Savings (effluent treatment) 1.5-2 Cr/Year

# FM Methodology -



# **Technology - Fuel Combustion**



		Scenario-1	Scenario-2	Scenario-3	Scenario-4 (Renewable)		Scenario-5
Parameter UOM Steam generation ( coal )		Steam generation with fossil fuel (coal)	Steam generation with Biomass as fuel	Steam generation with Green Hydrogen as fuel	Steam generation with Green Electricity	Electricity as direct utility	
		(With improved efficiency without carbon captured)	(With improved efficiency with carbon captured) (With improved efficiency with carbon captured)		=	=	=
Fuel cost	Rs/kg	7-9	7-9	5.5-8.5	400*	4-6	8-10
Thermal efficiency	%	68-70	68-70	72-75	84-87	95-98	93-96
Operating utility cost	Rs/MT steam	1600	1600	1650	8900	4100	7300
Energy cost reduction	%	21%	21%	20%	-400%	-107%	
Emission reduction	%	21%	100%	120%	0	0	0
ROI (with capex)	month	12	12+ capex for CC	36+ capex for cc	133	40	

- \* Considering green H2 cost as 85 Rs per kg, then steam cost is equivalent to Scenario 3
- \*\* Reduction in energy cost by 10% YoY upto 2030 will reduce the energy by 47% which can be worked on region/country PMdiseary content

#### **Typical Steam % Break up – Chemical Industry**



 Focus on equipment level of major steam consuming equipment

FORBES

- What is happening- Input/Output Variations
- What are the pain points/ concerns/Key priorities
- How can we reduce steam demand of major steam consuming equipment
- Energy benchmarking Monitoring & Sustenance for Product /Section wise

## **FM Credentials**



Condenser Reflux Reflux Rebolier Rebolier Steam In Rebolier		Name of Group	Start up(Ramp) time reduction in mins	Batch time reduction in Hours	Steam consumption reduction in %		
		1	SRF	28	2	4	
	Solvent Recovery / Low Pressure Distillation Column	+	UPL	18	1.15	6	
	Referen	ces in	Panoli Intermediates	20	1.5	5	
Pharmaceutical API/Chemical		KLJ Organics	11	0.35	3		
300 + 3 100/		Pidilite	17	0.25	4		
	Working References	nces Steam Consumption	Alembic	20	1.30	5	
		Reduction	MSN Labs	60	18	10	
	Pampup (Pail Up)		SMS Pharma	55	4	7	
	time	Batch Time	Alembic	35	1	6	
			Dr Reddy's	22	2	6	
	Optimized Pressure	Zero Steam Trap	Otsuka Chemicals	35	1	4	
	Regulation	Bypass Valve Opening	Sanofi	14	0.45	4.2	
			Virchow Labs	16	0.35	4	

#### Scaling from One Plant to Many : Through Sustenance Route



Chennai Based One of the fastest growing manufacturers of agrochemicals with an international reputation in crop protection and other allied segments. Have established facilities in the Panoli & Dahej regions

Challenges :		КЫ	Audit Baseline	Post implementation	UoM	Remark
•	Addressing the issues		data	of Proposals		
	of Pressure drop	Steam consumption	460	405	TPD	54.8 TPD steam saving - refer below table for details
	Optimisation of	Average Feed water temperature	68	83	Deg C	68 °C With Live steam and 83 °C is without live steam injection
	consumption	Condensate Recovery factor	28-32	58-65	%	Flash and condensate recovery from production blocks and MEE block
	lo address the lower	Trap Uptime %	69	95	%	
	factor	Dea-reator steam consumption	18	0	TPD	Steam valve is closed
	Losses across	Coal consumption	72.7	64.0	TPD	Coal saving - 8.7 TPD
	Insulation & steam system	Fuel bill @ Rs. 5.83 per kg for 5800 kcal/kg for 350 days	1484	1307	Rs. Lac per annum	Reduction of fuel bill - Rs. 177 Lac per annum

#### Scaling from One Plant to Many : Through Sustenance Route



Chennai Based One of the fastest growing manufacturers of agrochemicals with an international reputation in crop protection and other allied segments. Have established facilities in the Panoli & Dahej regions

Improvements					
in the	existing				
plant support					
Expansion while					
maintaining a					
minimal energy					
footprint with					
Max Capacity					
Utilization					

Proprietary content

	Avg. Producti on (TPD)	Average steam consumption (TPD)	Sp. Steam Consum ption Kg steam/ Kg Producti on	Steam consumpt ion without Encon proposal implement ation (TPD)	Steam Savings because of Encon proposal implementati on (TPD)	Coal savin g (TPD)	Monetary Saving for the period Nov -21 to Jan -23 (Rs. Lac) @ 14.5 Rs. Per Kg ( Rs. Lac)
Sep-20 to Apr -21 ( 8 months)	10.7	521	48.8				
Nov-21 to Jan -23 (15 months)	17.6	701	39.9	857	155	26.2	1660
Difference	6.9	↑ <sub>181</sub>	<b>1</b> 8.8	¥			
% Change	65%	35%	18%				

# **KPI Monitoring – On Real Time basis**







# Thank You

## www.forbesmarshall.com

Proprietary content

13